Department of Justice
Federal Bureau of Investigation

FBI LABORATORY

2004

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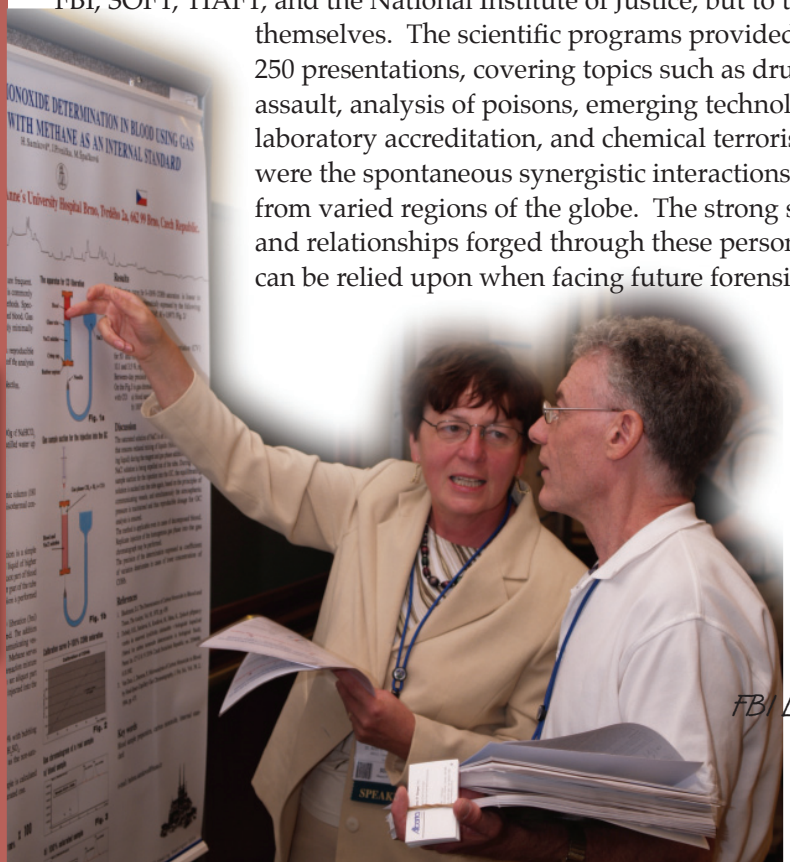
2004 FBI LABORATORY SYMPOSIUM ON FORENSIC TOXICOLOGY AND JOINT MEETING OF THE SOCIETY OF FORENSIC TOXICOLOGISTS

THE INTERNATIONAL ASSOCIATION OF FORENSIC TOXICOLOGISTS

In 2004, Washington, D.C. provided the setting for the first ever combined FBI Laboratory Symposium on Forensic Toxicology and Joint Meeting of the Society of Forensic Toxicologists (SOFT) and The International Association of Forensic Toxicologists (TIAFT). The combined event was held during the week of August 30 - September 3, 2004. Over 1,200 participants and exhibitors attended the conference, representing 52 countries from North America, Europe, Australia, Asia, Africa, and South America. As a result of the outstanding attendance, this became the largest annual conference held by either SOFT or TIAFT.

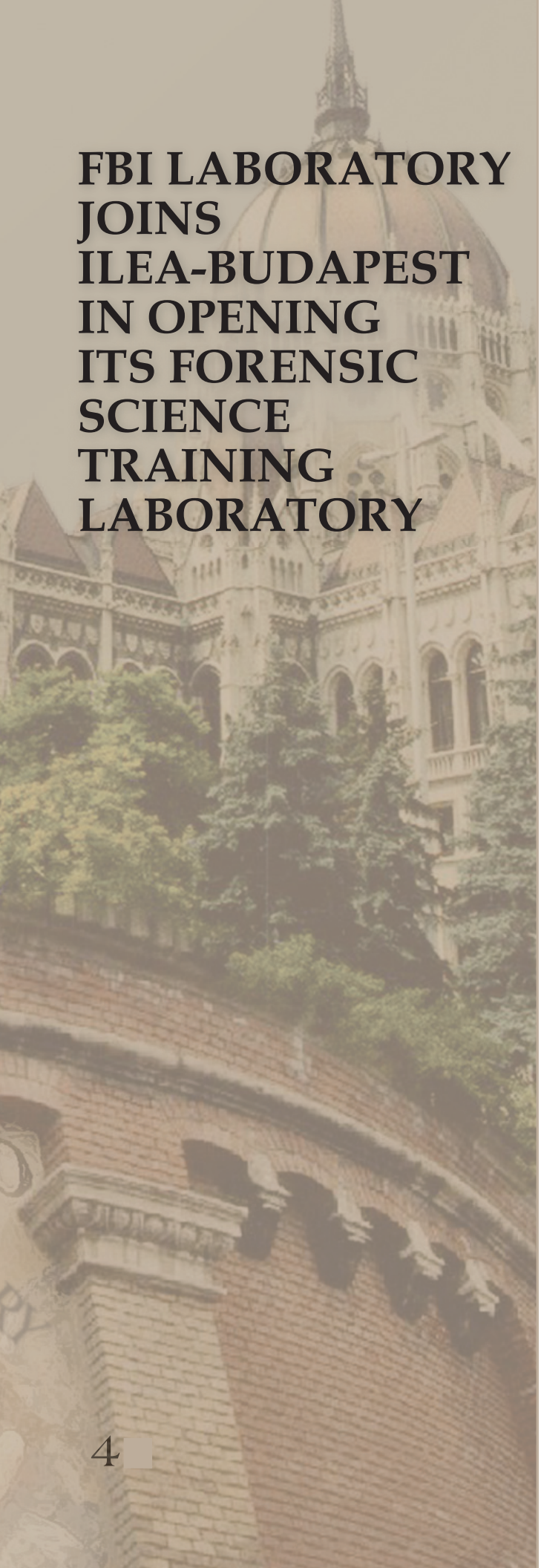
The success of the event can be attributed not only to the collaborative efforts of the FBI, SOFT, TIAFT, and the National Institute of Justice, but to the attendees themselves. The scientific programs provided more than 250 presentations, covering topics such as drug-facilitated sexual assault, analysis of poisons, emerging technologies, laboratory accreditation, and chemical terrorism. Equally valuable were the spontaneous synergistic interactions between scientists from varied regions of the globe. The strong scientific principles and relationships forged through these personal exchanges can be relied upon when facing future forensic challenges.



SYMPOSIUM FOR CRIME LABORATORY DEVELOPMENT

Since 1973, the Laboratory has sponsored an annual Crime Laboratory Development Symposium to provide management training for directors and senior managers of domestic and international publicly funded forensic laboratories. The symposium and associated expenses are provided free-of-charge to the attendees. A valuable component of this year's symposium was the half day briefing on the Research Partnership Program, where attendees received updates on current and future forensic science research projects.

The 32nd symposium was held August 30 to September 2, 2004 in partnership with the University of Minnesota's Carlson School of Management Executive Education Department. The theme of the symposium was *Improving Crime Laboratory Efficiency*. Keynote speakers included Donald T. Phillips, author of *The Founding Fathers on Leadership* and Brian Muirhead of the Jet Propulsion Laboratory who spoke to the Mars Rover Project. Twenty faculty from the school's Executive Education program provided graduate-level management and leadership training for more than 240 attendees from Federal, state, and local forensic laboratories.



FBI LABORATORY JOINS ILEA-BUDAPEST IN OPENING ITS FORENSIC SCIENCE TRAINING LABORATORY

The January 26, 2004 official grand opening of a forensic science training laboratory in the Budapest, Hungary International Law Enforcement Academy (ILEA), outfitted with over one million dollars worth of FBI-supplied lab equipment, ushered in a new era of international law enforcement training for Eastern Europe. The opening ceremony for the first such international training lab of its kind was the culmination of two years of planning and international collaboration between ILEA-Budapest, the Hungarian National Police, and the FBI Laboratory.

The ILEA was established in 1995 in Budapest, Hungary as a multi-national, multi-agency effort to address critical issues in new democracies by offering a core law enforcement program, modeled after the FBI's National Academy program. The FBI serves as the lead coordinating agency at the ILEA-Budapest, which serves 27 countries of Eastern Europe, Russia, and the Baltic states. The addition of a forensic science training facility to ILEA-Budapest will provide its students with information on new developments in the forensic sciences, which have slowed in these countries due to lack of resources following the collapse of the Soviet Union. Armed with new knowledge and possibilities from ILEA, these students will return to their home countries to combat their own crime problems – and assist the FBI and other U.S. investigators in international cases.

This new ILEA-Budapest forensic science training center consists of four types of training labs, all of which are primarily outfitted with laboratory equipment and instruments provided by the FBI Laboratory: Microscopy, Chemistry, DNA, and Instrumental Laboratories. These four laboratories will provide the capability to incorporate forensic science training into the eight-week course provided by ILEA-Budapest to law enforcement officials, as well as offer highly specialized forensic science courses to scientists in the forensic science institutes in the countries which it serves. Instructors will include FBI Laboratory experts and the FBI Laboratory will provide additional laboratory equipment in the future.

During the grand opening ceremony, members of the FBI Laboratory Counterterrorism and Forensic Science Research Unit (CTFSRU) performed a variety of lab demonstrations and provided presentations illustrating

Mr. Robert May of the FBI Laboratory's CTFSRU (right) demonstrates digital photography of developed latent fingerprints with alternate light source to the Hungarian Minister of the Interior, Dr. Monika Lamperth at the ILEA-Budapest Forensic Science Training Center Grand Opening Ceremony.

forensic investigative techniques that can be used by law enforcement personnel. These presentations also highlighted the capabilities of each of the ILEA-Budapest forensic science training labs.

Prior to the dedication of the center in January 2004, FBI Laboratory personnel were involved in all aspects of planning and development of the center. Scientists from the FBI Laboratory consulted on laboratory space allocation and use, made specific recommendations for laboratory furnishings, equipment, supplies, and reference materials, installed instruments and equipment donated by the FBI Laboratory, and provided maintenance training to ILEA-Budapest staff.

Cooperation between FBI Laboratory personnel and the ILEA-Budapest staff is continuing. The coordinator of the ILEA-Budapest Forensic Science Training Center was a recent visitor to the FBI Laboratory, where she received training from Laboratory personnel in various forensic science disciplines, including fingerprinting, trace evidence, chemistry, questioned documents, and instrumental analysis. The FBI Laboratory continues to assist ILEA-Budapest with recommendations for future equipment purchases, budgeting for equipment and supplies, course offering decisions, and ensuring the successful incorporation of forensic science training into their eight-week course. In addition, it is anticipated that the first specialized forensic science course, Forensic Analysis of Hairs and Fibers, will be offered in January 2005.

FBI personnel at the grand opening of the ILEA-Budapest Forensic Science Training Center. From left to right: Dr. Diane Williams (CTFSRU); Dr. Laura Kienker (CTFSRU); ILEA Director Dale Wegkamp; former EAD Charles Prouty, Law Enforcement Services; Robert May (CTFSRU); Dr. JoAnn Buscaglia (CTFSRU).

Stereo and Polarized Light Microscopes demonstrate a wide range of applications to the forensic examination of materials in the ILEA Microscopy Lab.

HAZARDOUS EVIDENCE ANALYSIS TEAM

The Chemical and Biological Sciences Unit (CBSU) was created to enhance the FBI's ability to conduct and/or direct forensic analyses of hazardous chemical, biological, and radiological / nuclear (CBRN) materials, as well as traditional evidence that is contaminated by those materials. Evidence of this type is often too hazardous for submission to the FBI Laboratory and must be examined at partner laboratories capable of containing and processing CBRN materials. Unfortunately, the FBI's partner laboratories were not designed to support the traditional forensic examination of contaminated trace and bulky evidence. To enhance the FBI Laboratory's capability to conduct traditional forensic examinations of contaminated evidence, the CBSU is leading the development of a Hazardous Evidence Analysis Team (HEAT). The HEAT, comprised of experienced FBI Lab Examiners and Technicians, is receiving advanced training to work with hazardous evidence at selected partner laboratories. Currently, the HEAT has 60 active members from several units within the FBI Laboratory, including: CBSU, Chemistry, DNA, Explosives, Firearms and Toolmarks, Hazardous Materials Response, Latent Prints, Photographic Operations Imaging Services Unit, Questioned Documents, and Trace Evidence.

To support HEAT operations CBSU is working with the Counterterrorism and Forensic Science Research Unit (CTFSRU) to validate forensic protocols, commonly used by the FBI Laboratory, for application at the various partner laboratories. As required, new protocols are being developed and validated. Additionally, CBSU is establishing dedicated forensic laboratory space within selected partner laboratories. That space is being equipped with laboratory equipment and instrumentation configured to support HEAT protocols.

HEAT members have received specialized training to handle and process hazardous CBRN evidence. They were trained to process radiologically contaminated evidence at the Savannah River National Laboratory (SRNL) near Aiken, SC, biologically contaminated evidence at the National BioForensic Analysis Center (NBFAC) at Fort Detrick, MD, and Chemically contaminated evidence at the Edgewood Chemical/Biological Forensic Analysis Center (EC/BFAC) at Edgewood, MD. Additional HEAT training, protocol development, and laboratory space renovations will continue in Fiscal Year 2005.

The HEAT will significantly enhance the FBI Laboratory's ability to thoroughly examine hazardous evidence in support of terrorism investigations.

FOUR REGIONAL MTDNA LABORATORIES PREPARING TO ACCEPT CASEWORK

Regional mtDNA laboratories will partner with the FBI Laboratory to augment the Bureau's capacity for no-cost mtDNA analysis in forensic and missing persons cases. When the partner laboratories become operational in September 2005, the FBI Laboratory's capacity to deliver no-cost mtDNA analysis to the criminal justice system will double. Cases will be submitted directly to regional mtDNA laboratories.

On September 30, 2003, the FBI awarded multiyear, cooperative agreements to the following agencies:

- Arizona Department of Public Safety, Phoenix, Arizona;
- Connecticut State Police, Meriden, Connecticut;
- Minnesota Bureau of Criminal Apprehension, St. Paul, Minnesota; and
- New Jersey State Police, Trenton, New Jersey.

The agreements provide for the FBI Laboratory to train and equip regional mtDNA laboratories and authorize casework that meets FBI quality standards. Partner laboratories will be responsible for mtDNA analysis, reporting results, and testifying, if necessary.

Since signing the cooperative agreements, the FBI Laboratory has provided training to all of the scientists from each of the Regional Laboratories at Quantico in laboratory procedures as well as scientific and legal issues affecting mtDNA analysis. The Regional Laboratories concomitantly have been renovating their laboratories and performing validation studies of the procedures they will be using.

In addition to the mtDNA capability, these laboratories will also have qualified hair examiners in order to conduct traditional hair examinations, submitting probative hairs for mtDNA analysis. These examiners also undergo training at the FBI Laboratory.

The FBI Laboratory is building long-term partnerships with state and local forensic laboratories to provide critical forensic services that it cannot provide by itself. The initial term of agreement is three years, but may be renewed indefinitely for two-year periods.

3D LASER SCANNING TECHNOLOGY

The FBI Laboratory utilizes leading-edge technology in support of its investigative and prosecutorial efforts. For example, crime scenes, vehicles and other types of objects can be documented and reconstructed quickly and accurately. Two Units within the Laboratory Division, the Structural Design (SDU) and the Investigative and Prosecutive Graphic (IPGU) Units employ state-of-the-art 3D laser scanning systems to document these examples and many other scenes. Each Unit uses both short and long range scanner systems to digitally document places or items of interest. The voluminous data collected by these systems are processed and refined into data sets that are then converted into 3D digital scene reconstructions or models, 3-D digital object models, 3D physical models, virtual walk/fly-throughs, or interactive or animated scene reconstructions. The primary purpose for the preparation of these items is for their use as investigative aids or as demonstrative evidence during trials. In addition, they can also be used for counterterrorism investigations, tactical planning for major events, and training.

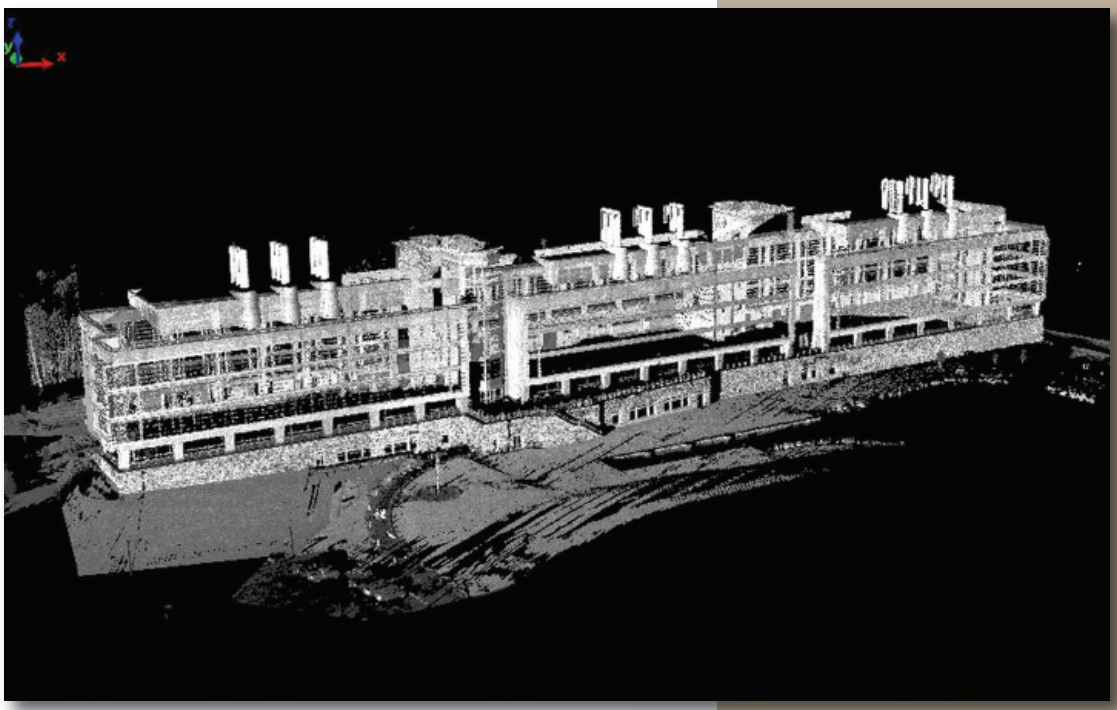
A Scanner works like radar, sending out a signal and then measuring the time it takes for the signal to return. Instead of sending out sound waves, it sends out laser beams at a rate of 2,000 points per second. Dependant on detail (grid spacing) and site conditions (terrain, amount of trees, and their proximity to buildings), a city block should take between 12-16 hours to measure. This is a fraction of the time other technologies would take to capture the same amount of 3D measurement data.

Terrorists are constantly assessing the vulnerabilities of high value targets, such as prominent national and international events. The planning of an effective security strategy by law enforcement at these potential terrorist targets is critical. To that end, the SDU and IPGU use 3D laser scanning technology to collect distance and elevation coordinates. These measurement data are used as a basis for the reconstruction as a three-dimensional model of a specific venue, to include terrain and building structures. These data would provide an accurate likeness to a particular location and could be used as a planning tool for law enforcement personnel tasked to provide security.

Three-dimensional physical scale models are constructed of areas where terrorist acts or other critical incidents

have occurred. These models give tactical response teams a realistic and accurate depiction of building layouts, including entry ways, doorways, windows and stairwells, or any interior structural obstructions. A physical model assists law enforcement with the safe and successful breaching of facilities to extricate hostages.

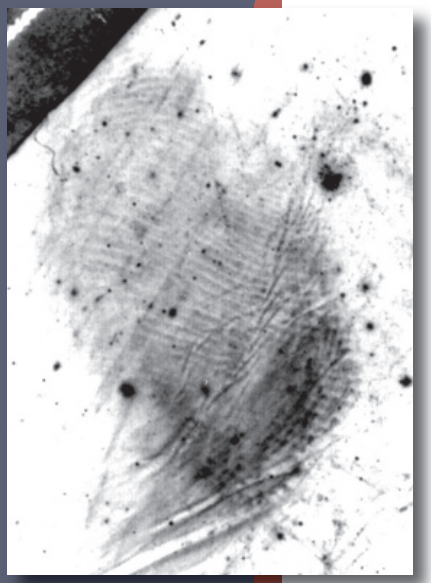
The 3D laser scanning technology currently possessed by the SDU and IPGU enables technicians to accurately collect detailed and precise 3D measurement data of a high value target, and if a subsequent terrorist attack should occur and buildings are destroyed the measurement data that has already been archived can be used for a prosecutorial model. This form of demonstrative evidence is a potent tool for the concise and clear explanation of facts by an expert or eye witness during courtroom testimony.



The development of this demonstrative evidence for use in aiding the Prosecutor with the presentation of his/her case frequently requires the SDU and IPGU technicians to travel to the crime scenes. Site surveys are conducted to obtain distance and elevation measurements as preparation for the accurate development of demonstrative evidence. The 3D laser scanning technology possessed by the IPGU and SDU enables technicians to quickly and accurately document the location as three-dimensional measurement coordinates which can be used to reconstruct the scene.

LATENT PRINT IDENTIFICATIONS AID IN CONVICTING ESCAPED PRISONERS ON A CRIME SPREE

A



Twenty-three latent fingerprints, two latent palm prints and one latent impression were obtained from thirteen items of evidence.

On November 4, 2002, two individuals escaped from the Hopkins County Detention Center in Madisonville, Kentucky. These individuals were Chadrick Fulks and Brandon Basham. The following day these two individuals carjacked and kidnapped an Indiana man in his GMC pickup truck. They left the victim tied to a tree in a remote wooded area. The man was able to free himself after fifteen hours.

Basham and Fulks drove to northern Indiana where they met up with two female friends. The four individuals eventually ended up in South Carolina. Investigations indicate that Basham and Fulks were possibly responsible for the abduction of a Marshall University coed on November 11, 2002 in Huntington, West Virginia. This coed remains missing and has been presumed dead.

November 14, 2002, a woman left her residence to go shopping at the Wal-Mart in Conway, South Carolina and never returned home. A Wal-Mart security video depicts the South Carolina woman in her BMW automobile at the store parking lot followed by a white pickup truck. A male passenger was seen exiting the truck and approaching the BMW. The next scenes in the video reveal the BMW following the truck to another area of the parking lot where the truck was abandoned.

The use of ATM cards confirms the abductions of the woman from South Carolina and the Marshall University coed. Fulks was positively identified at a gasoline station in Shallotte, North Carolina within hours of the South Carolina woman's abduction. While in the BMW, Fulks purchased gasoline, three soft drinks and two rolls of duct tape. A telephone call was made to the woman's daughter and tracked by cellular phone information to this same section of southeastern North Carolina.

On November 18, 2002, Basham attempted a carjacking in Ashland, Kentucky but did not follow through after seeing the woman on a cell phone and errantly believing she was dialing 911. However, a bystander was suspicious of Basham's intentions and dialed 911. Local police pursued Basham, now in his vehicle, which ultimately lead to a foot pursuit in which Basham had fired two shots at the officer. Basham was apprehended and taken into custody. In jail, Basham indicated the woman from South Carolina had been raped, stabbed and strangled with her purse strap and her throat had been cut. Her body was dumped in an unknown rural area and remains missing.

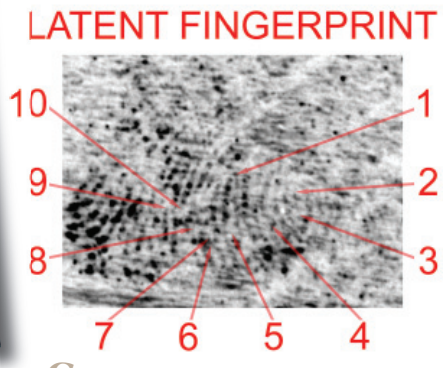
On November 19, 2002, information was obtained that Fulks had relatives in the Goshen, Indiana area. An attempt to locate Fulk's brother resulted in a traffic stop of the vehicle belonging to his brother. Both Fulks and his brother were in the vehicle. Fulks attempted to flee on foot. Fulks was eventually apprehended and arrested. During an interview with police, Fulks was linked to the carjacking in Indiana and South Carolina.

The South Carolina woman's BMW was recovered in Indiana with stolen Ohio license tags. The car was taken to the Merrillville Resident Agency in Merrillville, Indiana for processing.

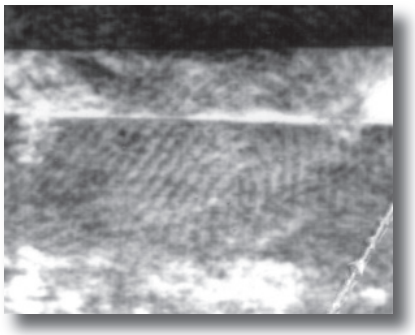
After the apprehension and arrest of Basham and Fulks, several residences and automobiles including the BMW were searched and processed for items of evidence. One of the pieces of evidence recovered was a small candy box containing numerous papers. Through interviews and interrogation this candy box and its contents belonged to the coed from Marshall University. This item was submitted by the Pittsburgh Division for handling by the FBI Laboratory. Basham and Fulks fingerprints were found on the papers from within the candy box.

Over one hundred-eighty items of evidence were submitted to the FBI Laboratory for examination. Numerous disciplines were tasked to examine the evidence in this case. The Latent Print Unit examined seventy-one items of evidence to process for latent prints. The items of evidence processed by the Latent Print Unit ranged from a firearm, ammunition, rolls of duct tape, lifts and miscellaneous items from the vehicles.

B



C



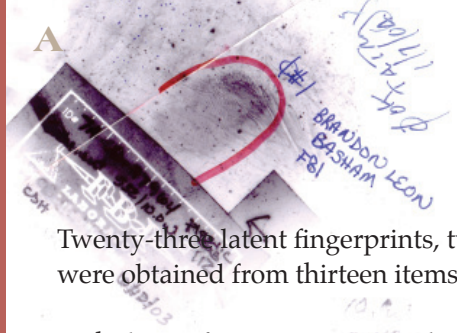
D

A Fingerprint developed on a white shopping bag, identified with the right thumb of Brandon Basham

B Fingerprint developed on a napkin,identified with the left index finger of Chadrick Fulks

C Charted enlargement of the left finger of Chadrick Fulks

D Fingerprint developed on Swisher Sweets wrapper, identified as the right middle finger of Chadrick Fulks

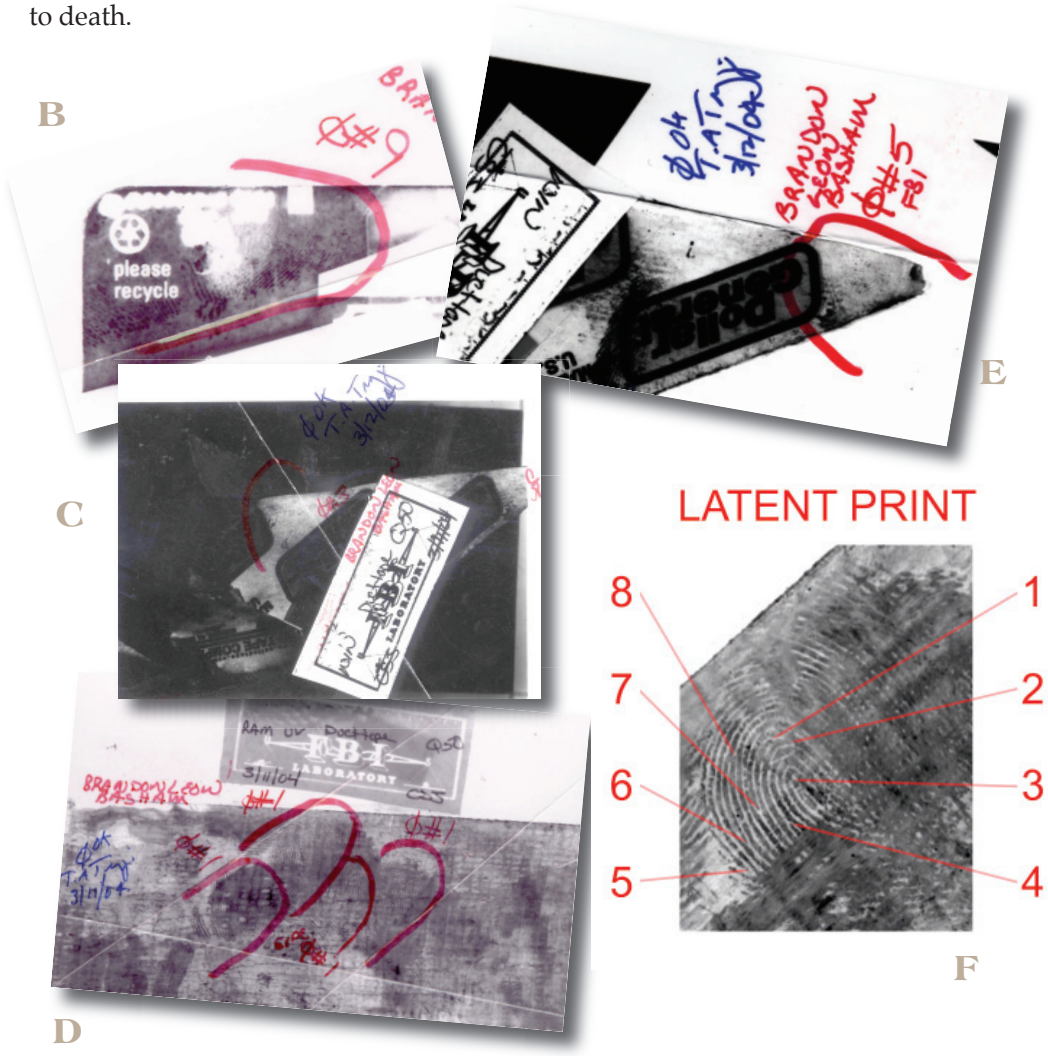


Twenty-three latent fingerprints, two latent palm prints and one latent impression were obtained from thirteen items of evidence.

Eight latent fingerprints were identified with Brandon Basham. These latent fingerprints were from items recovered from the South Carolina woman's BMW. Three latent fingerprints were identified with Chadrick Fulks, these items were also recovered from the BMW.

Basham and Fulks were held for trial in Columbia, South Carolina. Chadrick Fulks entered a guilty plea to murder in the first degree and other charges. A sentencing trial was held for Fulks and two Latent Print Unit examiners went to Columbia for the trial. One testified to the identifications made in the evidence submitted by the Pittsburgh Division related to the coed from Marshall University and the other examiner testified to the identifications made from items recovered from the BMW. Chadrick Fulks was sentenced to death.

Brandon Basham went to trial in this matter and the two Latent Print Unit examiners also testified in his trial. Brandon Basham was found guilty and was also sentenced to death.



A Fingerprint developed on a white shopping bag, identified with the right thumb of Brandon Basham

B Fingerprint developed on a roll of masking tape, identified with the left ring finger of Brandon Basham

C Fingerprint developed on a roll of duct tape, identified with the right little finger of Brandon Basham

D Fingerprints developed on a roll of duct tape, all identified with the right thumb of Brandon Basham

E Fingerprint developed on a roll of duct tape, identified with the little finger of Brandon Basham

F Charted enlargement of the fingerprint developed on a napkin and identified with Brandon Basham

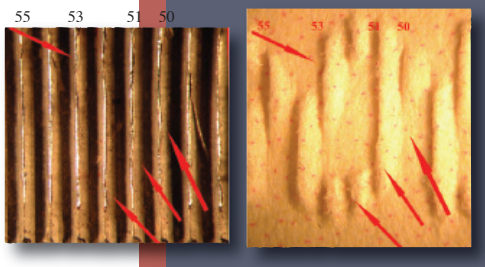
DRUG TRAFFICKING INVESTIGATION

In August 2003, a joint task force comprised of FBI and other Federal, State and Local law enforcement agencies executed 19 search warrants throughout the Atlanta, Georgia area, targeting suspected members of the Aremando Valencia-Cornelio Drug Trafficking Organization. Agents seized more than $2,500,000 in cash, eight vehicles, 13 weapons, over 500 pounds of marijuana, three pounds of methamphetamine, and 17 kilograms of cocaine. Also found during the searches were numerous ledgers and notebooks containing cryptic records in Spanish. The records were forwarded to the Cryptanalysis & Racketeering Records Unit for analysis.

In January 2005 a Unit examiner provided expert cryptanalysis testimony at the trial of eleven defendants in Federal court in Atlanta, Georgia. The examiner showed the jury how the records were deciphered, revealing over $54,000,000 in disguised drug payments, a list of names associated with the drug transactions, and records of money being sent from the United States to Mexico. The jury found all 11 defendants guilty on all counts.

CRRU Examiners analyzed hundreds of documents and ledgers like the one shown above. The highlighted portions indicate multi-kilogram cocaine transactions.

CHECK WRITER



In today's technology, people still use machines that many would describe as the dinosaur of yesteryear, such as typewriters and check writers. However, it would be wise to not overlook these outdated machines for they can provide valuable information as demonstrated in the case below.

On March 3, 2004, the FBI Laboratory's Questioned Documents Unit positively identified a check writer as the machine used to prepare the monetary portion of 36 checks utilized in a fraud scheme to obtain motor vehicles and other equipment. This examination involved the disassembly of the check writer, a careful examination of its platen (a backing mechanism which perforates the check) for wear characteristics, and a comparison of the checks to determine if any observed wear characteristics were transferred from the platen of the known machine to the image on the check.

The platen from the check writer submitted in this case had 168 ridges to perforate the paper. Each questioned check, in addition to a numerical entry, consisted of the text, ADOLS,@ and ACTS.@ Each check had wear characteristics that were observed in the corresponding area of the platen, as demonstrated in the photographs.

The photograph above consists of two portions:

The left-hand portion is an image of the platen taken from the AO@ in ADOLS.@

The right-hand portion is an image of the check, taken from the corresponding region.

Both sides are numbered with the platen ridge and are marked with arrows to demonstrate some of the wear characteristics in common between the platen and the corresponding impressed area on the check.

UNITED STATES OF AMERICA VS. WILLIAM JENSEN COTTRELL

Between 2:00 a.m. and 5:00 a.m. on August 22, 2003 six separate acts of vandalism occurred at four automobile dealerships and two residential areas outside of Los Angeles, California. The targets of these acts were Sport Utility Vehicles (SUV). Two incidents involved arson through the use of Molotov cocktails. A Hummer dealership in West Covina, California, experienced the most destruction with approximately seventy vehicles and a commercial building damaged by fire and/or the spray painting of pro-environmental statements. In total, approximately 125 vehicles and a commercial building were damaged or destroyed, with loss estimated in excess of two and a half million dollars. At approximately 10:00 a.m., a local radio station reported receiving an e-mail from the pro-environmental group Earth Liberation Front (ELF) claiming responsibility for the acts of sabotage that occurred earlier that day.

The FBI's Evidence Response Team, together with local law enforcement agencies, collected multiple items of evidence from the various crime scenes. Many of the items collected were submitted to the FBI Laboratory for analysis. Numerous Units within the FBI Laboratory received evidence for examination. The results from five Units are highlighted below:

Chemistry Unit

In September of 2003, 21 paint specimens recovered from multiple crime scenes were received and examined within the Chemistry Unit (CU). These specimens included blue, red, and white paint. The specimens were further separated into four groups based upon chemical composition, providing links among the crime scenes. All the paint specimens were found to have chemical compositions consistent with that found in spray paint formulations.

A can of spray paint, recovered from one of the crime scenes, was also examined. The contents were compared to all the submitted paint specimens and found to differ in physical attributes.

Articles of clothing, recovered from Joshua Thomas Connole, were received and examined for possible paint evidence. White and red paint materials recovered from the items were compared with the paint specimens recovered from the crime scenes. However, the

paint specimens from Connole's clothing were chemically different from the previously examined paint specimens. Additionally, articles of clothing and two cans of spray paint, recovered from William Jensen Cottrell, were examined. No paint evidence was recovered from Cottrell's articles of clothing. Furthermore, the two cans of spray paint were found to be intact and unused.

Furthermore, a blue liquid residue on a plastic item, recovered from an SUV at an automotive dealership, was also received and examined within the CU. Through chemical and instrumental analysis, it was determined that the blue residue was consistent with a liquid laundry detergent. It was conjectured, by the field investigators, that the detergent had been used as a thickener in a Molotov cocktail.

Trace Evidence Unit

On September 3, 2003, a headband found at the arson scene at Clippinger Hummer was received and processed in the Trace Evidence Unit (TEU). Numerous Caucasian head hairs found on the headband were suitable for significant microscopic comparison purposes and were preserved on a glass microscope slide awaiting the submission of a known head hair sample for comparison.

On September 17, 2003 a known head hair sample from Joshua Thomas Connole was received and examined in TEU. The Caucasian head hairs from the headband were microscopically dissimilar to the known head hairs from Joshua Thomas Connole, and he was eliminated as being the source of those hairs.

A known head hair sample from William Jensen Cottrell was received in TEU on Ferbuary 19, 2004. On March 23, 2004 the slide containing the hairs recovered from the headband was resubmitted to the laboratory where it was compared to the known head hair sample from William Jensen Cottrell. The hairs from the head band exhibited all of the same microscopic characteristics as the head hair sample submitted from William Jensen Cottrell, accordingly, these hairs were consistent with originating from William Jensen Cottrell.

DNA Analysis Unit II

The DNA Analysis Unit II examines biological items of evidence from crime scenes to determine the mitochondrial DNA (mtDNA) sequence from samples such as hair, bones and teeth. Typically, these items contain low concentrations of degraded DNA, making them unsuitable for nuclear DNA examinations. The high sensitivity of mtDNA analysis allows us to obtain information from old items of evidence associated with cold cases and small pieces of evidence containing little biological material. Since mtDNA is maternally inherited and multiple individuals can have the same mtDNA type, positive identifications are not possible using mtDNA testing.

A hair from the headband found at the Clippinger Hummer dealership was identified by the TEU and was submitted to the DNA Analysis Unit II for mitochondrial DNA testing. The mtDNA type obtained from the hair was the same as the mtDNA type obtained from William Jensen Conttrell.

DNA Analysis Unit I

The PCR Group within DNAU I performs nuclear DNA analysis examinations on body fluid stains and other potential DNA sources present on evidentiary items. With the advent of polymerase chain reaction (PCR)-based typing, DNA information can be copied and analyzed from minute amounts of sample. Because nuclear DNA is inherited from both parents, and as such is constantly being reshuffled, nuclear DNA is unique to a specific individual, with the exception of identical twins. The power of the testing done by DNAU I lies in its ability to potentially identify an individual as being the source of the DNA obtained from an evidence item to a reasonable degree of scientific certainty as well as the definitive power of exclusion.

Several items of evidence were collected, including the headband, which were examined in the DNA Analysis Unit I. Nuclear DNA profiles were developed for the evidentiary items. Later in the investigation, William Jensen Cottrell was developed as a person of interest. A reference sample from Cottrell was processed for nuclear DNA and compared to the profile from the headband. The nuclear profile of Cottrell matched the major profile obtained from the headband, with the probability of a random individual having the same DNA profile as that of the headband being approximately 1 in 370 million from a Caucasian population.

Latent Print Units

The Latent Print Units examined approximately 183 items of evidence and developed four latent prints suitable for identification purposes. Among the items examined were: bottles, glass fragments, fingerprint lifts, fuel containers, plastic bags, a crow bar, and 156 match boxes.

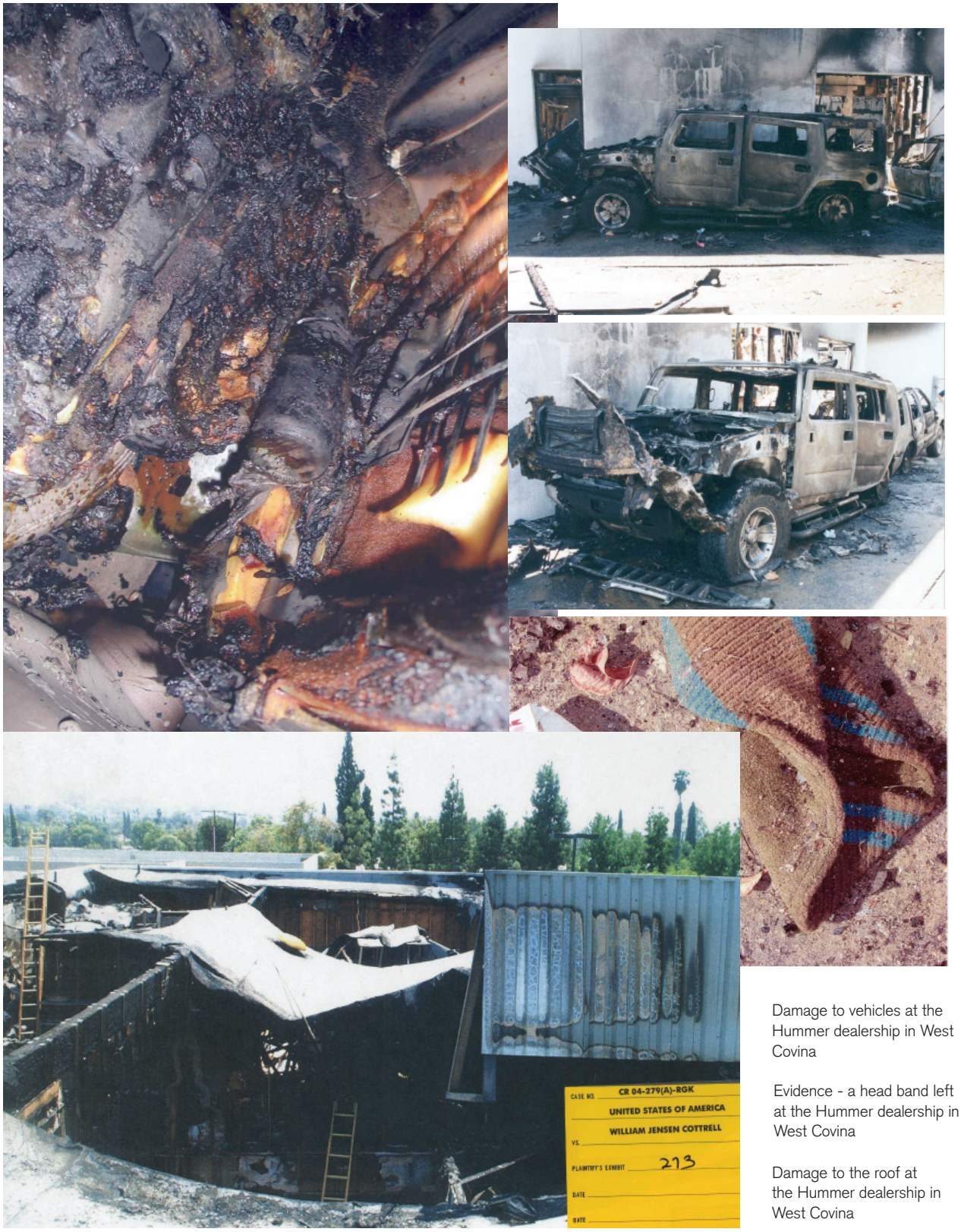
Conclusion

In March of 2004, William Jensen Cottrell was indicted in the Central District of California for conspiracy to commit arson, use of a destructive device during a crime of violence, and several counts of arson. In November 2004, four FBI Laboratory Forensic Examiners from the Units mentioned above traveled to Los Angeles to testify on behalf of the United States. On November 19, 2004, William Jensen Cottrell was found guilty of conspiracy to commit arson and seven counts of arson. On April 18, 2005, William Jensen Cottrell was sentenced to 100 months in Federal Prison, and was ordered to pay restitution of $3.58 million.

This case marks the first time an ELF claimed arson/vandalism has resulted in the conviction of a responsible party. Second, this case marks the first time that anyone in the Central District of California was given an upward departure in sentencing based upon the use of Domestic Terrorism by the subject to sway public opinion.

William Jensen Cottrell

Close-up of the destruction of a private residential vehicle by means of a Molotov cocktail



Damage to vehicles at the Hummer dealership in West Covina

Evidence - a head band left at the Hummer dealership in West Covina

Damage to the roof at the Hummer dealership in West Covina

NATIONAL MISSING PERSON DNA DATABASE PROGRAM

The National Missing Person DNA Database Program in the FBI Laboratory's DNA Analysis Unit II uses maternally inherited mitochondrial DNA (mtDNA) for the analysis of bone and tooth samples that contain small or degraded quantities of DNA. The DNA Analysis Unit I will process samples with a sufficient quantity of nuclear DNA. The results of the analysis are compared to blood and/or saliva submitted from the maternal relatives of missing persons to aid in the identification of missing individuals. Since 2000, the FBI's National Missing Person DNA Database Program has been responsible for developing mtDNA profiles from reference samples of biological relatives of missing persons and unidentified human remains. The National Missing Person DNA Database stores the mtDNA profiles in the Combined DNA Index System Missing Person (CODISMP) software. In Fiscal Year 2004, 199 cases were reported out and 283 cases were submitted to the National Missing Person DNA Database Program for analysis. Nationally, there were 21 cases where a match was made between the unidentified human remains and a biological relative of a missing person.

Prior to submitting unidentified human remains and/or samples from biological relatives of missing persons, contact should be made with the Program Managers at 703-632-7582 or 703-632-7586.

FLORIDA VICTIM: STEPHANIE SEMPELL

In 1976, investigators from the Monroe County Sheriff's Office recovered human remains which they were unable to identify. In November 2001, they became aware of the National Missing Person DNA Database and submitted a portion of the remains along with reference samples from maternal relatives of two missing individuals. The mtDNA profile from the bones was not the same as the mtDNA profiles from either of the submitted reference samples. The three mtDNA profiles were uploaded into the National Missing Person DNA Database.

The FBI Laboratory's DNA Unit I processed the DNA extracts from the bone for nuclear DNA but both attempts were unsuccessful. In February 2004, another individual, Stephanie Sempell, was linked to the remains. A reference sample from Stephanie Sempell's mother was submitted for comparison. The mtDNA profile developed from the bone was the same as the mtDNA profile from the reference sample from Stephanie Sempell's mother. In August 2004, the Florida medical examiner used this information along with other investigative information to identify the remains as those of Stephanie Sempell.

The local law enforcement released the information to the associated press in hopes that it would generate additional leads. Mitochondrial DNA was instrumental in ruling out two potential candidates in the earlier submission and supporting the possibility that the remains are from Sempell.

LACI DENISE PETERSON CASE
SAN FRANCISCO, CALIFORNIA

On Christmas Eve 2002, Laci Denise Peterson, a young pregnant woman, was reported missing after her husband returned from a fishing trip in San Francisco Bay. An extensive search was conducted garnering international media attention. After several months, her headless body and that of her unborn son were discovered on the shores of San Francisco Bay. Her husband, Scott Lee Peterson, was charged with her murder.

One piece of physical evidence, a hair from a pair of pliers found in Scott Peterson's fishing boat, was submitted to the FBI Laboratory for testing in the Trace Evidence and DNA II Units. The hair was determined to be microscopically consistent to hairs recovered from Laci Peterson's hairbrush. Mitochondrial DNA analysis revealed Laci Peterson could not be excluded as the source of this hair.

Defense counsel petitioned to exclude the results of the mitochondrial DNA testing on the hair. In October 2003, a lengthy admissibility hearing was conducted, and the court found forensic mitochondrial DNA analysis to be admissible.

Opening statements in the trial began in June 2004. The jury found Scott Peterson guilty in November 2004 and sentenced him to death.

ATTEMPTED BOMBING OF AMERICAN AIRLINES FLIGHT 63 "THE SHOE BOMBER"

On December 22, 2001, American Airlines Flight 63, a Boeing 767-300, en route from Paris to Miami with 183 passengers and 14 crew members, was diverted to Boston's Logan International Airport after a flight attendant smelled sulfur from a lighted match and noticed a passenger trying to ignite the tongue of his black, high-top sneaker. Passengers and crew members eventually overpowered the man and two doctors injected him with sedatives. Richard Colvin Reid, a 29-year-old British citizen, was subsequently charged with interfering with flight crew members and trying to blow up a trans-Atlantic flight with explosive devices hidden in his shoes.

Reid was indicted on nine counts, including the Attempted Wrecking of a Mass Transportation Vehicle and the Attempted Use of a Weapon of Mass Destruction, and eventually pled guilty. On January 30, 2003, Reid was sentenced in U.S. Federal Court to three life sentences, an additional 110 consecutive years in prison and several thousand dollars in fines for eight charges stemming from his failed attempt to blow up American Airlines Flight 63.

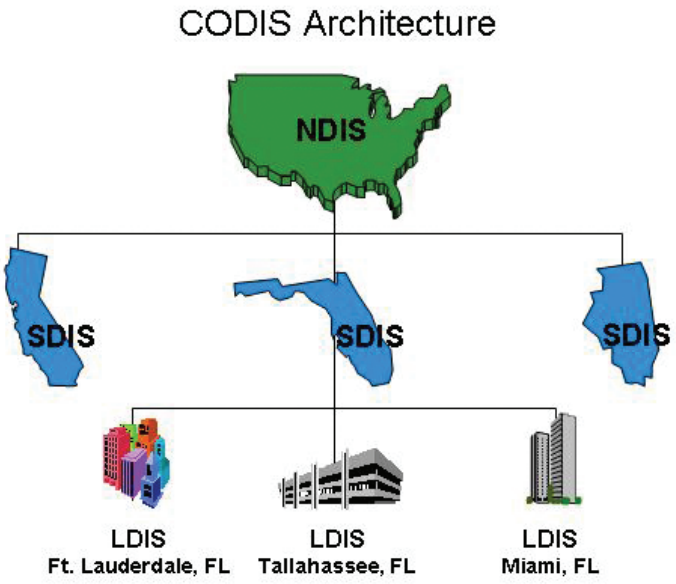
Both of Reid's shoes contained similar improvised explosive devices, also known as homemade bombs. Several components of these explosive devices were examined to determine their physical and chemical characteristics. These materials included the initiating system, main explosive charge and tape. Shown above is a photograph of one of Reid's shoes that contained an explosive device.

The identification of these materials allowed FBI Laboratory examiners to reconstruct the explosive device to determine the potential devastation if Reid were successful in his attempt to blow up the plane. Explosives demonstrations indicated that the explosive devices may have been large enough to rupture the skin of an airplane fuselage. Shown below are photographs of a demonstration in which a simulated shoe bomb was constructed and exploded on a piece of metal to depict the power of such a bomb.

COMBINED DNA INDEX SYSTEM (CODIS) UNIT

The CODIS Unit manages CODIS and the National DNA Index System (NDIS). The Unit is responsible for developing, providing and supporting the CODIS Program to Federal, state and local crime laboratories in the United States and selected international law enforcement crime laboratories, to foster the exchange and comparison of forensic DNA evidence from violent crime investigations. The CODIS Unit also provides administrative management and support to the FBI for various advisory boards, Department of Justice grant programs, and legislation regarding DNA.

CODIS can be considered the more generic term used to describe the FBI's program of support for criminal justice DNA databases as well as the software used to run these databases. The highest level in the CODIS hierarchy is NDIS containing the DNA profiles contributed by state and local participating forensic laboratories. There are 175 NDIS participating sites consisting of 122 local DNA index systems and 53 state DNA index systems.



The concept behind CODIS is to create a database of the States' convicted offender profiles and use it to solve violent crimes for which there are no suspects. CODIS enables Federal, State and local forensic laboratories to exchange and compare DNA profiles electronically, thereby linking serial violent crimes to each other and to known offenders. CODIS uses two indexes to generate investigative leads in crimes where biological evidence is recovered from the crime scene. The Convicted Offender Index contains profiles of individuals convicted of felony offenses and other crimes.

The Forensic Index contains DNA profiles developed from crime scene evidence, such as semen stains or blood. CODIS uses computer software to automatically search these indexes for matching DNA profiles.

Accomplishments

Combined DNA Index System (CODIS)

Category	*Total Number (Through January 2005) Cumulative Totals*
Investigations Aided	21,478
Forensic Hits	5,288
Offender Hits	14,381 (12,441 at SDIS & 1,940 at NDIS)

National DNA Index System (NDIS)

Category	*Total Number of Samples (as of 03/07/2005) Cumulative Totals*
Convicted Offender	2,201,874
Forensic	100,008
Missing Person	178

Participants

Domestic Laboratories	175 state and local laboratories plus NDIS
International Laboratories	35 laboratories in 22 countries
Training	986 individuals in over 211 laboratories have received CODIS training

Success Story

A 42-year-old convicted sex offender pleaded guilty to raping a former Prince William County, Virginia high school teacher in 1990. Terry L. McDonald, who is already serving a 48-year sentence for sexual assault, pleaded guilty in Prince William County Circuit Court to rape and abduction with intent to defile. On July 26, 1990, McDonald saw the high school teacher pushing her bike near Haymarket, Virginia. He got out of his car and asked for directions, then punched her in the face. He then dragged her into a wooded area and raped her. A day before the rape, McDonald who was serving time on burglary and sexual assault charges had escaped from a "road gang" of prisoners working in West Virginia. Until West Virginia authorities entered McDonald's DNA sample into the Combined DNA Index System (CODIS) late last year, the 1990 cold case had no leads. When McDonald's DNA matched samples recovered from the crime scene, Prince William investigators got a "cold hit." If a DNA match had not been made by CODIS, McDonald could have been released from prison in 2027 after a scheduled parole hearing. Prosecutors are expected to ask the judge to give McDonald the maximum punishment of two life terms in prison at his sentencing.

HAZARDOUS MATERIALS RESPONSE UNIT

The Hazardous Materials Response Unit (HMRU) provides rapid scientific and technical assessments of threats involving hazardous biological, chemical, radiological, and nuclear materials including Weapons of Mass Destruction (WMD). These assessments are provided to field divisions, Legal Attaches, and Headquarters Divisions including the Critical Incident Response Group, Counterintelligence, Criminal Investigative, Laboratory, Security, and Counterterrorism Divisions.

HMRU provides on-site operational and investigative assistance, including scientific and technical support to FBI investigations involving hazardous materials. HMRU supervises on-site safety of all FBI WMD searches, provides escort of WMD evidence to laboratories, on-site safety oversight at high-hazard crime scenes (e.g., collapsed structures and confined spaces), and supports tactical and hazardous device response operations where hazardous materials may be present.

During the 2004 calendar year, HMRU deployed on 117 missions, provided 229 scientific assessments, and participated in 280 conference calls.

There are currently 27 Hazardous Materials Response Teams (HMRTs) which operate in FBI field divisions and are supported by the HMRU. These teams are comprised of over 300 response personnel, predominantly FBI Special Agents, who require response equipment, medical monitoring, and specialized training.

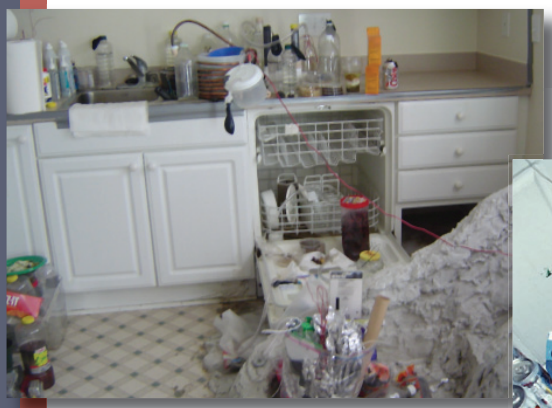
The HMRU provides training, certification and oversight to the 27 HMRTs. Training courses include Hazardous Materials Operations, Weapons of Mass Destruction Crime Scene, Biology of Hazardous Materials, Chemistry of Hazardous Materials, and Radiological Crime Scene courses.

In addition, HMRU assists the International Training and Assistance Unit by providing seven different types of WMD exercises, crime scene training, incident command and WMD re-certification. In 2004, HMRU personnel traveled to Macedonia, Uzbekistan, Rwanda, Albania, Greece, Moldova, and Croatia to provide courses in Weapons of Mass Destruction.

The HMRU provides guidance and support to the U.S. Department of Justice's Office for State and Local Domestic Preparedness Support and the FBI's Weapons of Mass Destruction Unit. The Unit also provides technical instruction and support to the tactical training and operations of the FBI's Critical Incident Response Group for WMD, which includes Special Weapons and Tactics (SWAT) teams, the Hostage Rescue Team, and Special Agent Bomb Technicians.

Case Work

At the request of the Seattle Division, HMRU deployed to assist with the execution of a search warrant for the presence of hazardous materials at the residence of Robert Alberg. The Seattle Division's investigation revealed that Robert Albert had purchased and received five pounds of castor seeds, sodium hydroxide, mercury, potato dextrose agar, magnesium hydroxide, uranium oxide rocks, and lithium hydroxide. Alberg sent numerous disturbing e-mails to his family members regarding his possession of anthrax and the making of poisons. Alberg also had in his possession a 14-step procedure for making ricin. The HMRU and Seattle HMRT personnel, wearing Level C personal protective equipment (PPE), entered Alberg's residence and collected sixty-two evidentiary items. Numerous containers of ricin in various stages of production including over five pounds of castor seeds were seized. The HMRU personnel transported the items of evidence to two laboratories, the U.S. Naval Medical Research Center and to the U.S. Army Edgewood Chemical/Biological Forensic Analytical Center. On August 11, 2004, Robert Alberg entered a guilty plea to Title 18, USC, Section 175(b) for knowingly possessing a biological agent (ricin toxin). Based upon Alberg's diminished mental capacity, Alberg



Robert Alberg's Kitchen

Castor seeds in plastic bag

Plastic spray pumps with Ricin

was given no prison time, but received a sentence of five years probation which included accepting mental treatment, and making restitution of $12,000 payable to the Environmental Protection Agency.

During the 2004 Summer Olympic Games in Athens, Greece, HMRU personnel assisted the U.S. Embassy by providing Subject Matter Experts (SMEs) in Hazardous Materials Response, Chemical Threat Agents, Biological Threat Agents, and Radiological Threat Agents. HMRU was provided as a resource to the Hellenic National Police, and provided support to the United States Secret Service during the visit of the former President George H. W. Bush and the daughters of current President George W. Bush. HMRU also coordinated with the Department of Energy assets and met with representatives from the Department of Health and Human Services, the Centers for Disease Control and Prevention, and other US government agencies.

Hazardous Materials Response Unit

Hazmat personnel in protective equipment

COUNTERTERRORISM AND FORENSIC SCIENCE RESEARCH UNIT

Personnel of the Counterterrorism and Forensic Science Research Unit (CTFSRU) instructed 33 different specialty classes during 2004, which were attended by students from local, state, federal, and international law enforcement facilities. These classes provide general training in the fundamentals of forensic sciences including chemistry, biology, photography, digital imaging, and video analysis and hands-on training in the use of specific scientific techniques for the forensic evaluation of evidence. Courses offered in 2004 include:

- Administrative Advanced Latent Fingerprint
- Clandestine Digital Imaging of Evidentiary Photography
- Crime Scene and Surveillance Photography
- Digital Imaging of Evidentiary Photography
- Digital Imaging Technology for the Capture of Latent Impressions
- ERT Advanced Photography
- Evidentiary Photography
- Facial Imaging from Human Remains Using Re/Face
- Fluorescent Digital Imaging Technology
- Forensic Analysis of Paints and Polymers
- Forensic Infrared Spectrometry for Trace Analysis
- Forensic Mitochondrial DNA Analysis
- Instrumental Analysis of Explosives and Explosive Residues
- Latent Fingerprint Photography

DNA ANALYSIS UNIT I

One of the major goals established for the DNA Analysis Unit I (DNAUI) is to train Federal, state and local forensic scientists, prosecutors, investigators and judges concerning the serological and DNA typing procedures used in the unit. Included within this goal is the DNAUI's additional role for providing instruction in regard to the FBI's DNA Auditor Training Program and compliance to the FBI Director's Quality Assurance Standards for Forensic DNA Testing and Convicted Offender DNA Testing Laboratories. These objectives were facilitated by Unit personnel teaching approximately 1,600 students throughout the United States and abroad in 2004.

International training regarding nuclear DNA STR Analysis was provided in March 2004 at the Einstein Institute for Science, Health, and the Courts in Concepcion, Chile, and in December at the Institute of Forensic Science in Beijing, China. Also in March 2004, a Bloodstain Pattern Recognition course was provided in London, Canada.

DNAUI examiners were faculty for several courses throughout the year focusing on educating prosecutors in nuclear DNA Analysis. The courses were provided through organizations such as the American Prosecutors Research Institute (APRI), the National College of District Attorneys, the California District Attorney's Association, and the Department of Justice.

In support of FBI Laboratory programs such as the Indian Country Evidence (ICE) Task Force and the Evidence Response Teams (ERT), DNAUI examiners participated at schools sponsored by these programs. Subject material of lectures provided included DNA Evidence Collection, basic DNA biology, and nuclear DNA analysis. Similar lectures were provided at conferences sponsored by the FBI on Crimes Against Children and Violent Crime Analysis.

The majority of training provided by DNAUI is through DNA Auditor Training courses sponsored by the FBI. As stated earlier, the emphasis of this course is to train and qualify individuals as auditors using the Quality Assurance Standards (QAS) for forensic laboratories. Nine such courses were taught both at the FBI Academy and throughout the United States by the DNAUI Unit Chief and Quality Assurance Program Manager during 2004. These courses qualified approximately 280 individuals as QAS Auditors to help support the forensic DNA community.

DNAUI Examiners Anthony J. Onorato (back row, far left), Jennifer C. Luttman (next to Onorato) and Eric G. Pokorak (back row, far right) at The Advanced Techniques in Forensic DNA Evidence class sponsored by the National District Attorneys Association at the National Advocacy Center.

DNAUI Examiner Jennifer C. Luttman with Professor Zhou Yunbiao, Director of Forensic Science of Peoples Republic of China and Lan Hu (DNA Supervisor).

DNAUI Examiner Jennifer C. Luttman discussing validation results and case applications in the Institute of Forensic Science, Ministry of Public Security, Peoples Republic of China, Beijing Science.

EVIDENCE RESPONSE TEAM UNIT

ERTU directs an aggressive training program which included numerous training courses for field ERT personnel, to include ERT Basic, Post-Blast Investigation, Advanced Photography, Digital Evidence Collection, Advanced Latent Fingerprints, Detection and Recovery of Human Remains, Large Vehicle Bomb Investigation, Shooting Trajectory, and Blood Detection. ERTU recognizes expertise in forensic disciplines by entities outside the FBI and finances selected personnel to training offered by other agencies and organizations under the Government Employees Training Act (GETA).

ERTU has also supported international training missions coordinated by other FBI Units in places such as Thailand and Greece.

Field ERT personnel in the ERT Unit-conducted ERT Basic Training Course

FIREARMS/TOOLMARKS UNIT

The training given by Firearms/Toolmarks Unit (FTU) personnel in 2004 consisted of the following:

- One-week school on **"Basic Firearms Identification"** in April, 2004 in Bangkok, Thailand;
- One week schools on **"Gunshot Residue Analysis"** in Altoona, PA in September, 2004 and West Palm Beach, FL in February, 2004; and a
- One week **"Bullet Trajectory"** school in Phoenix, AZ in February, 2004, and a **"Serial Number Restoration"** class given to international students during an FBI **"Explosives"** school in Saudi Arabia in April, 2004.

The FTU also participates in the "Honors Intern" training program. This past summer the FTU was fortunate enough to have two honor students who were involved in FTU research projects. During this summer period these students received a basic training in "Firearms/Toolmarks Identification" and "Gunshot Residue Analysis."

LATENT PRINT UNITS

The Latent Print Units (LPU) provided training for professional organizations and specialized courses for operational entities during the past year. Several examiners provided lectures and workshops on latent print matters at several educational conferences. Specialized training was provided to law enforcement personnel with the FBI's Evidence Response Teams, Indian Country Training Courses, New Agents' Training Classes, and the National Academy. The LPU hosted a three-day workshop for 15 members of the Jordanian National Police. In addition, the LPU continues to provide training on a regular basis for newly-hired Physical Scientists / Forensic Examiners to become certified latent print experts.

QUESTIONED DOCUMENTS UNIT

In 2004, the Questioned Documents Unit (QDU) provided training to Federal, state, and local entities in a variety of areas. Evidence collection training was provided to Indian country investigators in Reno, Nevada, and Helena, Montana. Photography techniques and chemical enhancement in the area of shoe print and tire tread impressions were taught to field photographers and evidence collection personnel. A general overview of the examinations conducted and service provided by the QDU was provided to scientists during a toxicology symposium in Washington, D.C. Additionally, personnel in the QDU provided training by way of presentations at the International Association of Identification and the American Academy of Forensic Scientists meetings.

TRACE EVIDENCE UNIT

Three one-week Indian Country Evidence Task Force crime scene examination schools were conducted by TEU personnel. These schools were held in Reno, Nevada; Syracuse, New York; and Helena, Montana. In addition, TEU participated in the Wind River Native American Conference held in Lander, Wyoming.

The unit also assisted the Evidence Response Team Unit in teaching the Evidence Response Team basic class located in Woodbridge, Virginia, and at the ERT Team Leaders Conference in San Diego, California.

One two-week Introduction to Hairs and Fibers course was taught at the FBI Academy and a one-week Introduction to Hairs course was taught in New Jersey. This course is designed to teach the basics of hair and fiber analysis to state and local law enforcement laboratory personnel.

Numerous workshops and lectures were also conducted by TEU personnel, including a forensic soil workshop in Adelaide, Australia, and an optical cross-sectioning workshop in Mystic, Connecticut.

INVESTIGATIVE AND PROSECUTIVE GRAPHIC UNIT

The Investigative and Prosecutive Graphic Unit (IPGU) is an operational Unit whose mission is to provide support for FBI investigations. The Unit's support capabilities are divided into four broad based program areas. These areas are Crime Scene Survey/Scan and Reconstruction; Forensic Facial Imaging; Demonstrative Evidence and Support for the Director's Office, SIOC and the Counterterrorism Division.

The Crime Scene Survey/Scan program provides for the high-end, 3D digital scanning/surveying of scenes for documentation and reconstruction purposes. These scenes encompass interior and exterior locations; large and small structures; terrain mapping, both above ground and subterranean; vehicles, both interior and exterior; aircraft crash sites and many other types of scenes. The Unit uses state-of-the-art 3D laser scan and digital Total Station systems to accomplish these tasks. The data collected with this equipment are processed, refined and output in the form of 3D digital/electronic models, electronic scene or object reconstructions, virtual scene fly/walk thrus, interactive virtual models, computer animations and 2D drawings/plans. To support many of these types of requests Unit personnel are required to travel to remote field locations, both nationally and internationally, to conduct their surveys/scans. In a majority of these cases, these services are provided in direct support of operational entities such as the Evidence Response Team Unit (ERTU), field ERTs, Hazardous Materials Response Unit (HMRU), Explosives Unit (EU), and Firearms/Toolmarks Unit (FTU).

Support provided through the Forensic Facial Imaging (FFI) program includes the preparation of artist composite drawings, 2D and 3D facial reconstructions from human skeletal remains, facial age progressions, post mortem drawings and high-end digital photographic retouching. The preparation of artist composite drawings often requires Unit personnel to travel to field locations to conduct witness/victim interviews. Recently, the Unit installed a state-of-the-art Video Teleconferencing System (VTS) which can also be used to conduct remote interviews. In one such scenario, a Unit employee used this technology to conduct a witness interview in a homicide investigation. The witness was incarcerated in Pago Pago, American Samoa, at the time the interview was conducted and the IPGU employee was in Washington. As a result of the information obtained during this interview, a composite drawing of the victim was prepared. From this composite, the victim was identified and the subject was apprehended.

The Demonstrative Evidence program provides a vital link between the Prosecution, the Court and the jury. This program is used to convey the inner workings of highly sophisticated criminal activities into a format that can be easily understood by a "lay-person." Often, these materials are used to explain highly complex crimes that involve numerous transactions, numerous co-conspirators and extremely large sums of money. Items of demonstrative evidence are produced in the form of maps, charts, diagrams, illustrations, interactive electronic presentations and PowerPoint presentations.

Being an operational entity, Unit personnel are called upon to respond anywhere in the world where the FBI is conducting an investigation. Because of this, employees have been dispatched to almost every state in the U.S., as well as 22 foreign countries. In doing so, the Unit has provided operational support for numerous Major Case investigations such as PENTBOMB, SANDBOMB, OKBOMB, RIYADHBOMB, SCOTBOMB, KENBOMB, TANBOMB, SNIPEMUR, BOMBING OF THE U.S.S. COLE, War Crimes Tribunal–KOSOVO, and the Bombing of KHOBAR TOWERS.

SCIENTIFIC WORKING GROUPS

Currently, the Laboratory sponsors the following Groups:

- *Scientific Working Group for Forensic Document Examination (SWGDOC)*
- *Scientific Working Group for Friction Ridge Analysis, Study and Technology (SWGFAST)*
- *Scientific Working Group for Materials Analysis (SWGMAT)*
- *Scientific Working Group for Microbial Genetics and Forensics (SWGMGF)*
- *Scientific Working Group on Forensic Analysis of Radiological Material (SWGFARM)*
- *Scientific Working Group for Scent Detection Dogs (SWGDOG)*
- *Scientific Working Group on Bloodstain Pattern Analysis (SWGSTAIN)*
- *Scientific Working Group on DNA Analysis Methods (SWGDAM)*
- *Scientific Working Group on Firearms and Toolmarks (SWGGUN)*
- *Scientific Working Group on the Forensic Analysis of Chemical Terrorism (SWGFACT)*

Since the early 1990s, the FBI Laboratory has sponsored Scientific Working Groups to improve forensic science discipline practices and build consensus with Federal, state, and local forensic community partners. The role of the Scientific Working Group is to create, prepare and publish guideline documents for the affected forensic community. Guideline documents provide Federal, state and local crime laboratories with a solid basis for operational requirements. Enforcement of guideline documents is left to the appropriate governing agency and the internal policy statements for requiring compliance with published guidelines. Membership to a Scientific Working Group is at the discretion of the Chair of the working group.

In 2004, sixteen Scientific Working Group meetings were held. The Scientific Working Groups published discipline specific documents in Forensic Science Communications or other discipline appropriate journals. Examples of recent publication on Forensic Science Communications include: Quality Assurance Guidelines for Laboratories Performing Forensic Analysis of Chemical Terrorism; Report of Current Activities of SWGDAM Y-STR Subcommittee; Revised SWGDAM Validation Guidelines; and Quality Assurance Audit for Forensic DNA and Convicted Offender DNA Databasing Laboratories.

Scientific Working Group for Forensic Document Examination

The purpose of the Scientific Working Group for Forensic Document Examination (SWGDOC) is to assemble representatives from the forensic document examination community in order to: 1) define the scope and practice areas of the profession, 2) standardize operating procedures, protocols, and terminology, 3) consolidate and enhance the profession of forensic document examination, and 4) promote self regulation, documentation, training, continuing education, and research in the area of forensic document examination. SWGDOC meets twice a year.

As of the end of 2004, SWGDOC has produced nine standard guides which have been published by American Society for Testing and Materials (ASTM)

International, an independent company dedicated to the development of international standards used around the globe. This publication process includes the balloting of draft standards to ASTM's forensics committee, which consists of forensic scientists from various disciplines, as well as forensic document examiners. SWGDOC has also produced three additional guides which are currently in the ASTM balloting process.

In addition to the guides which have been or are currently going through the ASTM process, SWGDOC has produced an additional nine standard guides which are awaiting balloting in the ASTM process.

Scientific Working Group on Friction Ridge Analysis, Study and Technology

The Scientific Working Group on Friction Ridge Analysis, Study and Technology (SWGFAST) mission is to establish general acceptance of guidelines and standards for the United States forensic latent print examination community. This Group has been in existence since 1995 and has created eleven approved guidelines. The membership consists of latent print experts from local, state and Federal law enforcement agencies, along with key individuals in associated scientific studies, management and legal backgrounds. SWGFAST has been instrumental in providing input on issues relevant to latent print matters with other professional organizations, such as the American Society of Crime Laboratory Directors – Laboratory Accreditation Board (ASCLD-LAB), the International Association for Identification (IAI) and the National Institute for Standards and Technology (NIST). During this past year, members of SWGFAST met with a broader base of criminal justice community members to establish the framework for a fingerprint based solicitation by the National Institute of Justice (NIJ). On an annual basis SWGFAST holds an open discussion during the IAI Educational Conference to receive feedback and comments on existing guidelines or to address new topics. Through grant money from NIJ, SWGFAST is managing the development of a fingerprint source book that will provide an excellent resource for the entire community.

Scientific Working Group for Materials Analysis

The Scientific Working Group for Materials Analysis (SWGMAT) held their annual meeting at the FBI Academy from March 29 to April 2, 2004. SWGMAT has a membership of approximately 65 people, assigned to five specialty groups in the area of trace evidence analysis: 1) The Fiber Sub-group, currently chaired by Eileen Davis, manager of the trace evidence section of the Virginia Division of Forensic Science, 2) The Paint Sub-group, chaired by Scott Ryland of the Florida Department of Law Enforcement, 3) The Glass Sub-group, headed by co-chairs David Green of Lake County, Ohio Regional Forensic Laboratory and Jodi Blakely Webb assigned to the Trace Evidence Unit (TEU) of the FBI Laboratory, 4) The Tape Sub-group, chaired by Jennifer Smith of the Missouri Highway Patrol, and 5) The Hair Sub-group, whose leadership transitioned in 2004 from Faye Springer of the Sacramento County Forensic Services Laboratory to Karen Lanning, assigned to the TEU of the FBI Laboratory. The current overall chairman of the SWGMAT is Maureen C. Bottrell, assigned to the TEU of the FBI Laboratory.

All sub-groups of SWGMAT have made great progress in the past year. The Fiber Sub-group completed their Training Workbook/Guideline and the Hair Sub-group completed their Human Hair Examination Guidelines, and they were both published in Forensic Science Communications in April, 2005. The Glass Sub-group completed their comprehensive analytical guideline and training guidelines, and they were published in Forensic Science Communications in January, 2005. The Paint Sub-group has completed their Paint Microspectrophotometery (MSP) Guideline, and it is in the final editing stages prior to publication.

Since SWGMAT's last meeting, the Tape Sub-group continues to work on their analytical guideline. The Paint Sub-group is conducting their final edits on the Paint MSP Guideline, and will then move on to drafting a guideline document for infrared spectrometry of paints, and producing a training guideline. The Hair Sub-group has started work on their training guidelines. The Fiber Sub-group is revising and greatly expanding their previously published analytical guidelines, and is participating in a collaborative exercise on microspectrophotometric analysis of the spectral variation across garments, and the variation in results between laboratories using different analytical equipment. Both the Fiber and Glass Sub-groups are beginning to discuss interpretation issues with the goal of writing interpretation guidelines. While the paperwork requesting a SWGMAT meeting has been completed and turned into the appropriate parties in the FBI, no SWGMAT meeting has yet been scheduled for Fiscal Year 2005.

Scientific Working Group on Microbial Genetics And Forensics

The Scientific Working Group on Microbial Genetics and Forensics (SWGMGF) was established in 2002 and is comprised of approximately 40 individuals from academia, the U.S. National Laboratories including Lawrence Livermore National Laboratory and Los Alamos National Laboratory, the private sector, and a variety of U.S. Federal Government agencies, including the Centers for Disease Control and Prevention and the Department of Homeland Security. The SWGMGF is composed of the following five sub-groups: Collection and Preservation of evidence related to Biological Threat Agents (BTAs); Nucleic Acid Signatures; Physical and Chemical Signatures; Validation and Interpretation; and Databases and Strain Repositories. Each group identifies areas where specific scientific advances could advance the field, and communicates these topics to the wider scientific community through the publication process and the SWGMGF membership.

The SWGMGF has published Quality Assurance and Quality Control Guidelines for this newly emerging field of forensics. These guidelines provide a framework for the wider scientific community to understand and follow should they be faced with analyzing evidence related to microbial case work. The areas covered include method

validation, personnel training, physical security, evidence processing, and laboratory organizational management.

Currently, the SWGMGF is focused on narrowing the knowledge gaps that exist in this newly emerging field. Members are also constantly assessing new technologies and methods that may help characterize BTA evidence and result in legally admissible testimony.

Scientific Working Group on Forensic Analysis Of Radiological Material

The Laboratory Division has a Scientific Working Group (SWG) offering guidance to practitioners of each of its forensic disciplines and rounded out the weapons-of-mass-destruction-related SWGs with the formation this past year of the Scientific Working Group on the Forensic Analysis of Radiological Materials (SWGFARM). The mission of this group is to develop guidelines for the forensic identification, characterization, and attribution of evidence in planned, threatened, or actual acts of radiological terrorism. The SWGFARM is composed of the following four sub-committees: 1) Quality Assurance and Protocols, 2) Infrastructure and Facilities, 3) Collection and Processing, and 4) Assessment and Attribution. It is comprised of representatives from 21 Federal agencies and institutions involved in the production, detection, measurement, monitoring, analysis, use, and investigation of incidents involving radiological materials.

Scientific Working Group in Bloodstain Pattern Analysis

Scientific Working Group in DNA Analysis Methods

Two scientific working groups meet semi-annually under the auspices of the FBI Laboratory to evaluate new technologies through cooperative experimental studies, deliberate issues of common interest and to formulate policies pertinent to: bloodstain pattern analysis (Scientific Working Group in Bloodstain Pattern Analysis - SWGStain) and serological testing/DNA profiling (Scientific Working Group in DNA Analysis Methods - SWGDAM). Both working groups are attended by national and international forensic laboratory representatives.

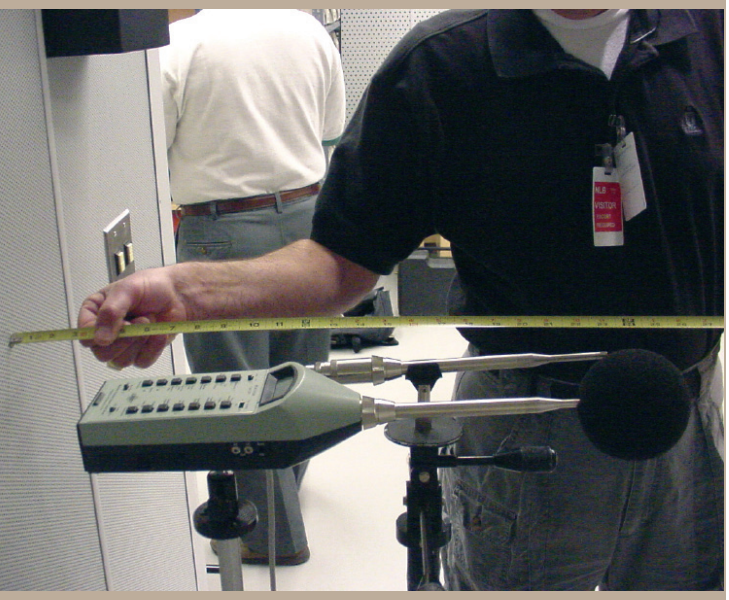
Highlights of the year's SWGDAM meetings would include: (1) revisions of the forensic DNA and convicted offender DNA databasing laboratory audit document as well as the FBI Director's quality assurance standards for DNA testing laboratories; (2) definition of expert allele calling system requirements, quality assurance criteria for such systems, and requirements for system validation; (3) an interlaboratory study on recovery of DNA from bones preparatory to mitochondrial DNA analysis; (4) development of quality assurance standards for serological testing procedures; (5) formulation of interpretation guidelines for Y-STR typing results and design of an interlaboratory study of Y-STR detection sensitivity using centrally-prepared template; and, (6) discussions of mass disaster software deficiencies in the area of kinship searches.

The newest working group, SWGStain, has undertaken an ambitious program to: (1) develop a standard operating procedure document for bloodstain pattern analysis at crime scenes; (2) formulate guidelines to enable thorough preparation for both admissibility and trial circumstances; (3) devise suitable taxonomy and terminology for bloodstain pattern descriptions; and, (4) update the SWGStain by-laws to include rules of professional conduct.

Scientific Working Group for Firearms and Toolmarks

The Scientific Working Group for Firearms and Toolmarks (SWGGUN) held two meetings at Quantico during fiscal year 2004. The SWGGUN Board granted final approval for the adoption of guidelines which were established for Projectile Path Reconstruction Training and Procedures Manuals. Final approval also was granted for adoption of a guideline statement for the advisable Range of Conclusions for examinations that could involve identifications. These procedures have been posted on the SWGGUN.ORG web site.

Progress is continuing to be made by the committee for addressing Forensic Examinations for Silencers as well as the Trigger Pull committee, which continues to collect data for the comparison of trigger pull testing equipment. A committee to address Minimum Qualifications for Firearms and Toolmark Trainees was formed and is beginning to collect information to use in the formulation of a recommendation.



Preparation for Silencer testing

Scientific Working Group on Shoeprint and Tire Tread Evidence

The purpose of the Scientific Working Group on Shoeprint and Tire Tread Evidence (SWGTREAD) is to serve as a professional forum in which experts in the forensic analysis of shoeprint and tire tread evidence and practitioners from related fields, share, discuss and evaluate methods, techniques, protocols, quality assurance, education, and research relating to shoeprint and tire tread evidence. SWGTREAD meets twice a year.

The first SWGTREAD meeting was held in September 2004. By-laws and six draft guides were written at this meeting. The draft guides were mailed to 50 certified footwear examiners and were also published in the Journal of Forensic Identification for comment.

The second meeting was held in March 2005 where work continued on the draft guides.

RESEARCH PARTNERSHIP PROGRAM

The Research Partnership Program, which is coordinated by the Counterterrorism and Forensic Science Research Unit (CTFSRU), is an effort of the FBI Laboratory to improve forensic science through the establishment of active collaborations with scientists in state and local forensic laboratories. Research and development projects and database building are funded through the Program. These projects leverage the experience of state and local forensic examiners for research purposes, in disciplines that typically require extensive examiner training and experience to interpret results.

The primary goals of the Program are as follows:

- Enhance the development and transfer of new forensic technologies and procedures to case-working examiners in state and local forensic laboratories by collaborative research and development, testing, and validation studies

- Facilitate the implementation of protocols defined by scientific working groups

- Catalyze the development of national forensic databases

In 2004, five research partnership workshops were hosted by the CTFSRU:

- **Permanence of Friction Ridge Skin Detail** — Permanence is one of the fundamental principles of the friction ridge discipline that permits identification. Although permanence is supported by the biological sciences, it has yet to be studied empirically by comparing fingerprints over time. Seven research partners compared friction ridge detail on prints recorded using ink, photography, and digital imaging.

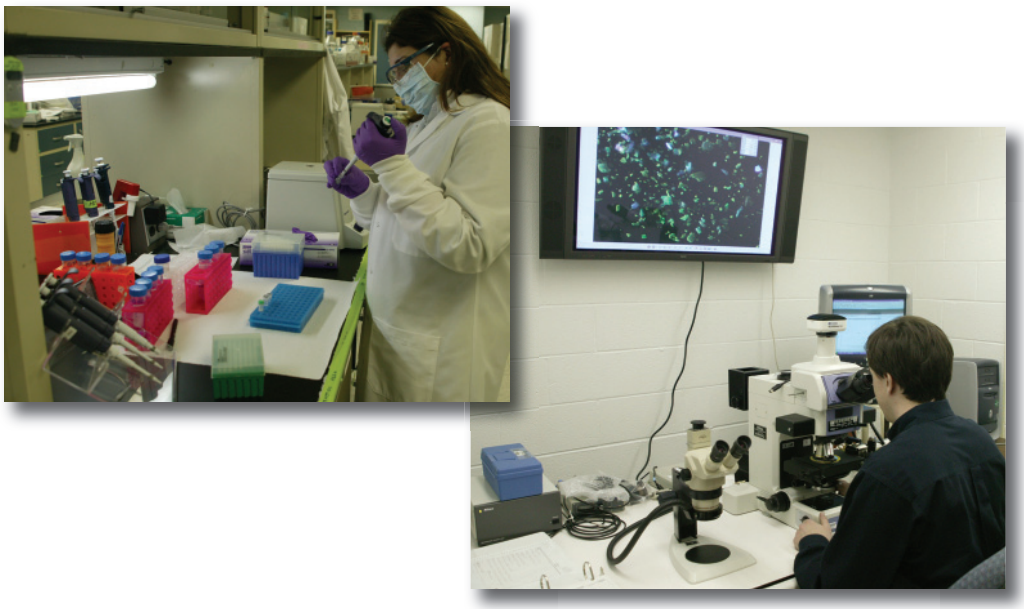
- **Evaluation of Automated Microscopy of Spermatozoa** — The goal of this project is to evaluate automated methods of searching microscope slides for the presence of sperm cells in smears and swabs. Four research partners participated in the initial evaluation of computer-assisted sperm searching instrumentation.

- **Visualization and Identification of Pepper Spray** — Colorless pepper spray is difficult to detect on evidence. A chemical reaction, designed by CTFSRU scientists, produces a vivid color when reagents are sprayed onto a garment that has been exposed to pepper spray. Four research partners participated in a workshop that highlighted the protocol for analyzing colorless, UV dye-free pepper sprays on a variety of clothing types.

- **Field Tests for Presumptive Detection of Gunshot Residues** — The goal of this project is to develop a rapid, nondestructive, field-deployable test to detect the presence of gunshot residues (GSR) on surfaces. On-the-spot presumptive GSR detection would assist crime scene investigators by providing a rapid response and would increase the efficiency of collection of samples for laboratory analysis. A portable GSR detection sensor was provided to the FBI for evaluation. Four research partners assisted FBI Laboratory personnel with performing experiments with these sensors at Quantico and are continuing their tests at their home laboratories.

- **Automotive Carpet Fiber Database** — Automotive carpet fibers are frequently found in abduction and homicide cases when victims were transported in vehicles. The FBI Laboratory's Trace Evidence Unit can determine the make, model, and year of vehicles on the basis of physical, optical, and chemical information searches of the Automotive Carpet Fiber Database. Two research partners began reviewing and compiling database elements on automotive carpet fibers. The contributions from state and local forensic laboratories will update the database and maintain its continued effectiveness as an investigative tool.

A Research Partner Program update was held on August 31, 2004, in conjunction with the annual Crime Laboratory Development Symposium at Minneapolis, Minnesota. The update featured 22 technical presentations and 34 posters by Laboratory research personnel and external contractors covering the biological, chemical, and physical sciences.



VISITING SCIENTIST PROGRAM

The goal of the Visiting Scientist Program is to enhance the research and development capabilities of the Counterterrorism and Forensic Science Research Unit (CTFSRU) by providing highly qualified scientists from outside institutions to complement staff scientists and assist in performing duties consistent with the mission and needs of the CTFSRU. The Visiting Scientist Program provides a direct connection between the FBI Laboratory and academia. Through the program, university students, postgraduates, and faculty enhance their education by participating in forensic research initiatives in the FBI Laboratory using state-of-the-art equipment. Participants are afforded unique work experience that offers professional development and increases their research contribution in their chosen field of study within the realm of forensics.

Experienced staff scientists guide the visiting scientists' research by serving as mentors. Each visiting scientist is assigned one or two projects focused on meeting the needs of the operational units. Program participants spend three months to three years working in the FBI Laboratory in Quantico, Virginia. At the end of their tenure, they are required to submit detailed reports and/or technical papers for publication in peer-reviewed scientific journals. Interested people may apply to participate in the Visiting Scientist Program at the following website: www.orau.gov/orise.htm.

In 2004, program funding allowed the FBI to offer this opportunity to 41 visiting scientists representing 30 academic institutions. During 2004, visiting scientists were actively involved in 35 research projects, contributed to the publication of 14 manuscripts, and were involved in 49 scientific presentations.

Examples from among the 35 research projects with contributions from visiting scientists in 2004 are provided below.

Detection of Peroxide Explosives and Their Residues

An analytical method was developed for the characterization and identification of organic peroxide explosives and a protocol was developed for detection of their residues in post-blast debris.

Ink Analysis by Capillary Electrophoresis

A capillary electrophoresis method was developed for analysis and identification of the various organic and ionic dye components in ink. A manuscript entitled, "Forensic Analysis of Black Ballpoint Pen Inks by Capillary Electrophoresis" is currently undergoing review.

Spectrochemical Analysis of Children's Fingerprints

A method utilizing infrared microspectroscopy was developed for analyzing children's latent fingerprint residues. Three major classes of compounds were consistently found in children's fingerprint residues including esters, carboxylic acid salts, and proteins. A presentation of results was made to the American Chemical Society Meeting in September, 2004 in Philadelphia, PA.

Optimization of Mitochondrial DNA (mtDNA) Extraction and Purification

Studies are underway to determine the optimum time for mtDNA extraction and to assess the effectiveness of DNA purification columns for hair, blood, and saliva specimens.

Forensic Applications of Cathodoluminescence of Geologic Materials

The use of cathodoluminescence is being evaluated as a means to determine the geographic origin of mineral grains. Cathodoluminescence is being studied as a point of comparison in forensic examinations involving soils, building materials, and other geologic material.

Creation of a New FBI Facial Identification Catalog

A customized FBI Facial Identification Catalog is being developed which will include a collection of photographs that will be sorted anthropologically by facial features.


FEDERAL BUREAU OF INVESTIGATION
LABORATORY DIVISION